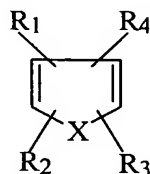


CLAIMS

We claim:

1. A method for treating sickle cell disease in a patient in need thereof, comprising the step of administering to said patient a compound of formula



where

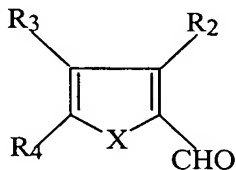
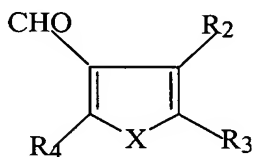
R1 is CHO, or an aldehyde protecting group;

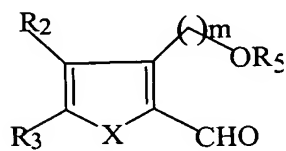
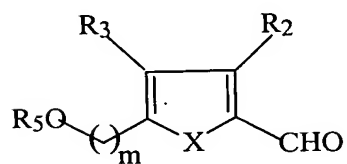
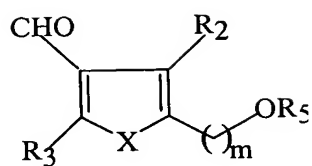
R2, R3 and R4 are the same or different and are H, OH, alkyl, alkoxy, hydroxy-alkyl, halogen, aryl or O-aryl;

and X = NH, O, S, Se or P;

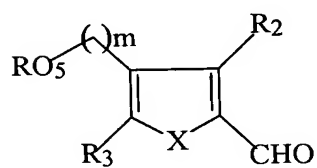
and wherein said compound is administered in sufficient quantity to ameliorate symptoms of sickle cell disease.

2. The method of claim 1, wherein R1 is CHO; R5 is H, alkyl or aryl; and m = 1-6; said compound being selected from the group consisting of

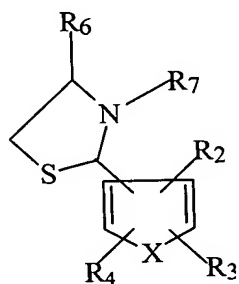




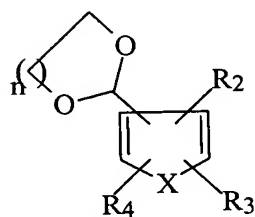
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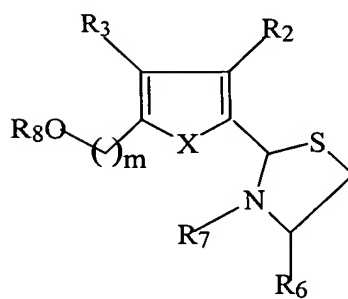
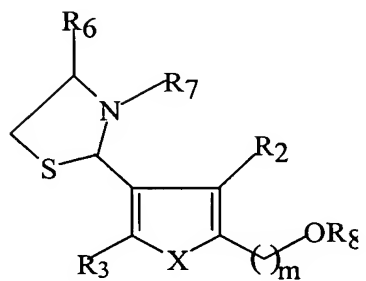
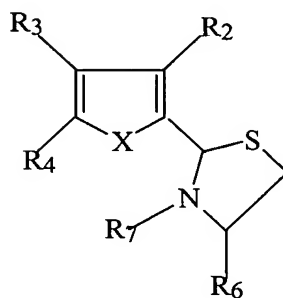
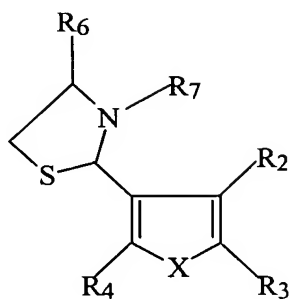
3. The method of claim 1, wherein R1 is a heterocyclic ring; R6 and R7 = H or alkyl; and n = 0-4; said compound being selected from the group consisting of

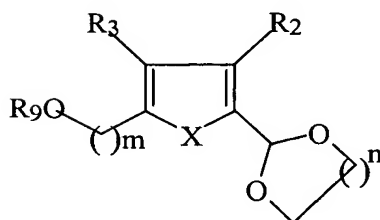
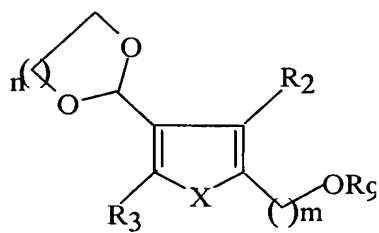
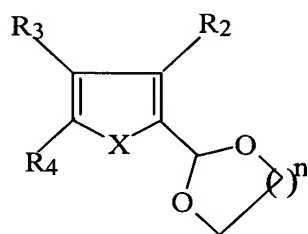
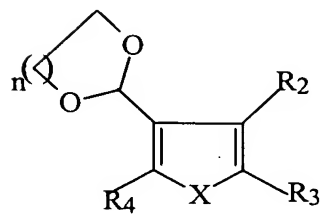
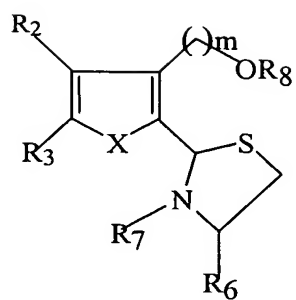


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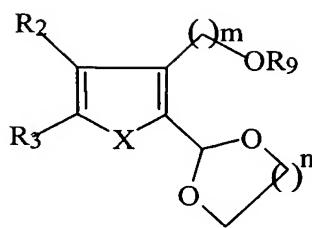


4. The method of claim 3, wherein R8 and R9 = H, alkyl or aryl, and said compound is selected from the group consisting of

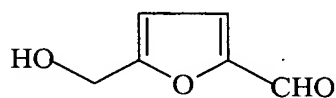
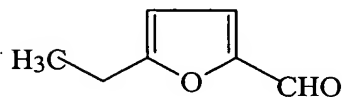
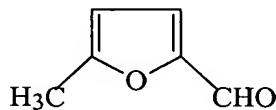




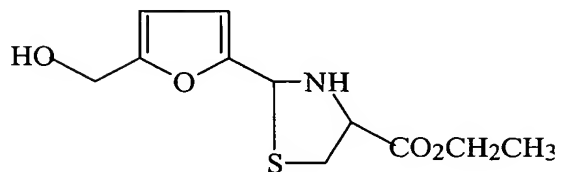
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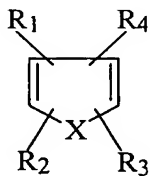
5. The method of claim 1, wherein said compound is selected from the group consisting of



and



6. A method for treating jaundice in a patient in need thereof comprising the step of administering to said patient a compound of formula



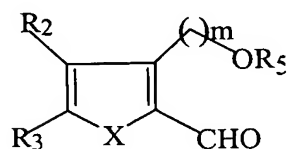
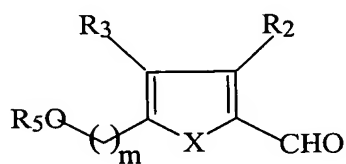
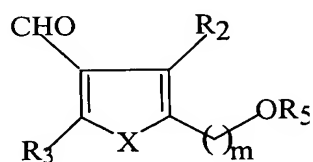
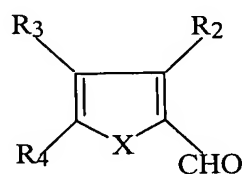
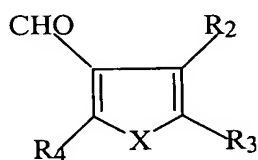
where

R1 is CHO, or an aldehyde protecting group;

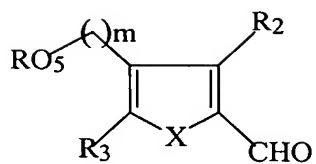
R₂, R₃ and R₄ are the same or different and are H, OH, alkyl, alkoxy, hydroxy-alkyl, halogen, aryl or O-aryl;
and X = NH, O, S, Se or P;

and wherein said compound is administered in sufficient quantity to ameliorate symptoms of jaundice.

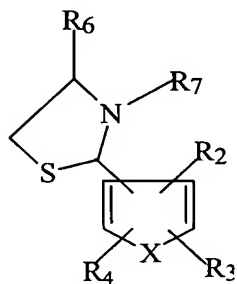
7. The method of claim 6, wherein R₁ is CHO; R₅ is H, alkyl or aryl; and m = 1-6; said compound being selected from the group consisting of



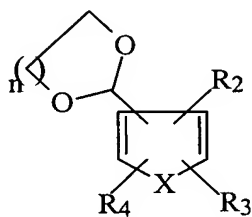
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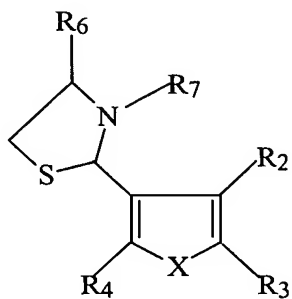
8. The method of claim 6, wherein R1 is a heterocyclic ring; R6 and R7 = H or alkyl; and n = 0-4; said compound being selected from the group consisting of

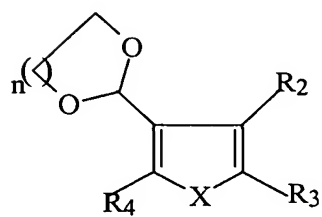
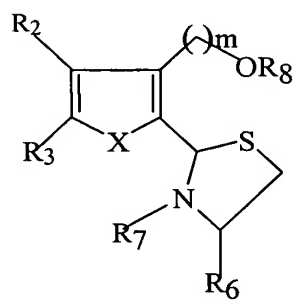
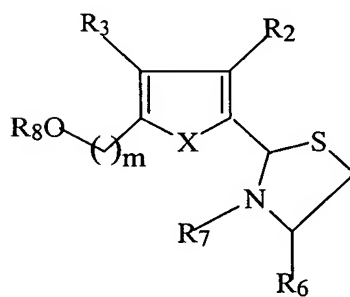
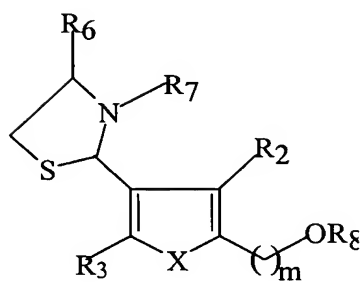
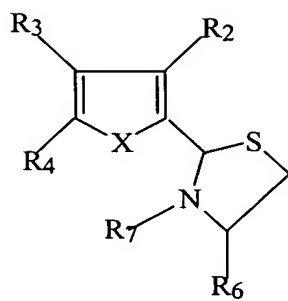


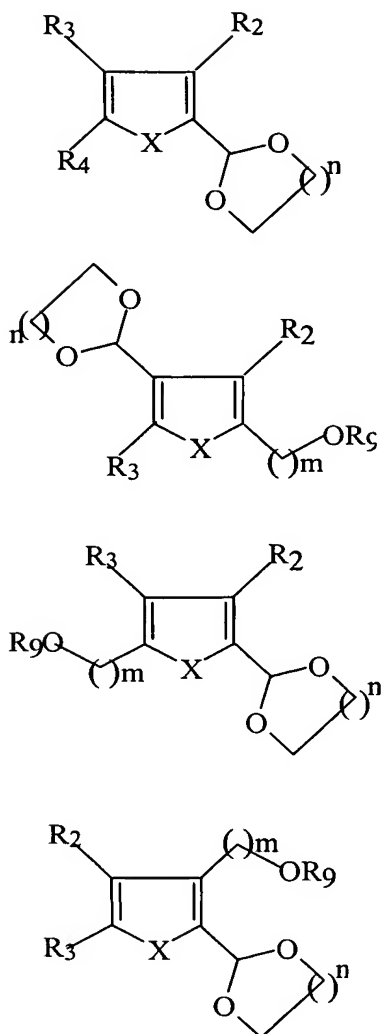
and



9. The method of claim 8, wherein R8 and R9 = H, alkyl or aryl, and said compound is selected from the group consisting of

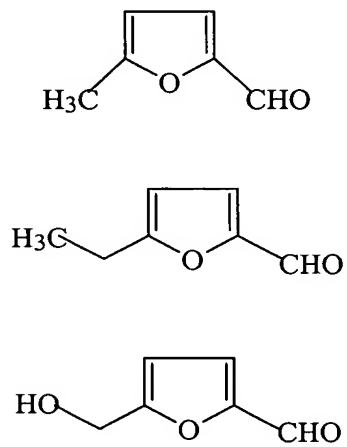




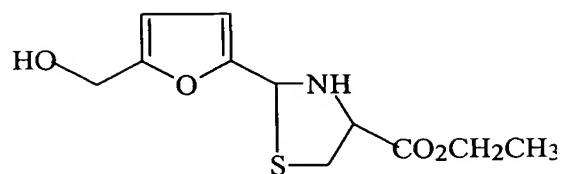


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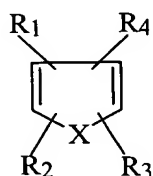
10. The method of claim 6, wherein said compound is selected from the group consisting of



and



11. A method for treating elevated bilirubin in a patient in need thereof comprising the step of administering to said patient a compound of formula



where

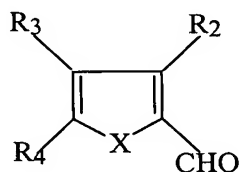
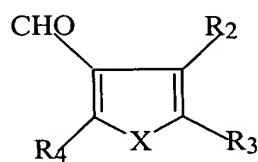
R₁ is CHO, or an aldehyde protecting group;

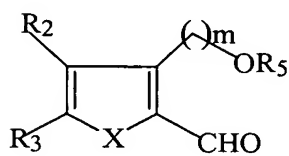
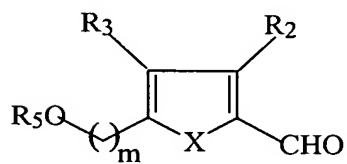
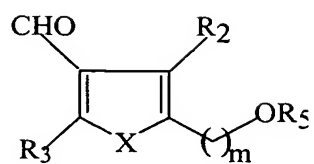
R₂, R₃ and R₄ are the same or different and are H, OH, alkyl, alkoxy, hydroxy-alkyl, halogen, aryl or O-aryl;

and X = NH, O, S, Se or P;

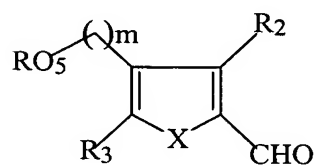
and wherein said compound is administered in sufficient quantity to ameliorate symptoms of elevated bilirubin.

12. The method of claim 11, wherein R₁ is CHO; R₅ is H, alkyl or aryl; and m = 1-6; said compound being selected from the group consisting of

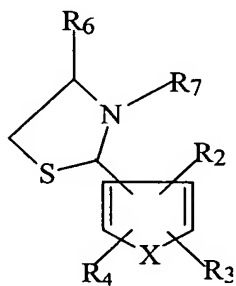




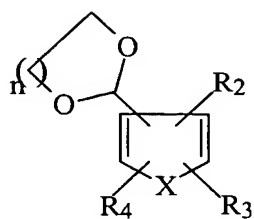
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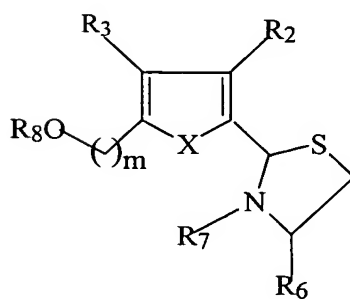
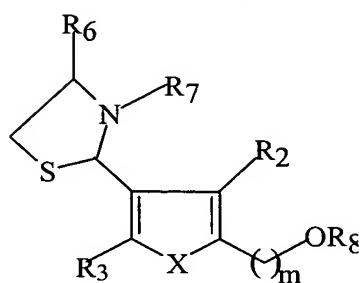
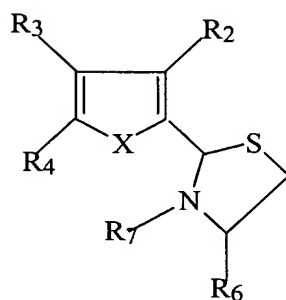
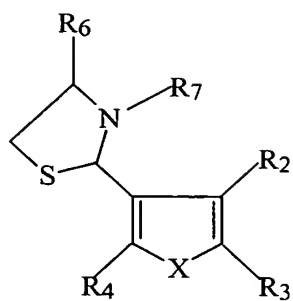
13. The method of claim 11, wherein R₁ is a heterocyclic ring; R₆ and R₇ = H or alkyl; and n = 0-4; said compound being selected from the group consisting of

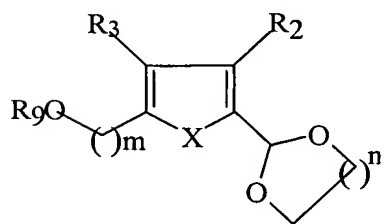
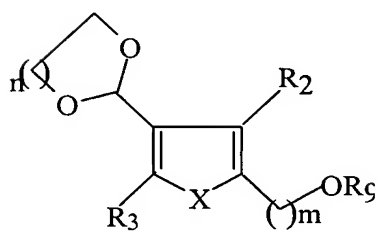
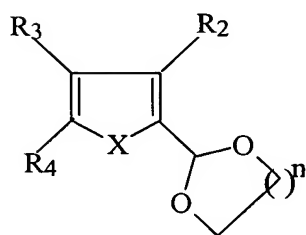
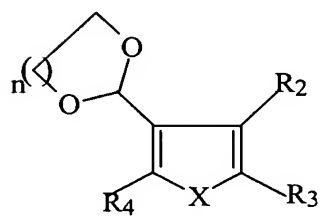
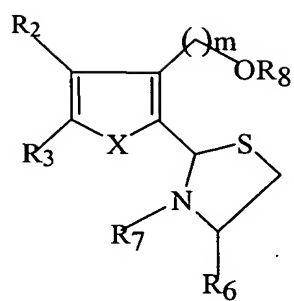


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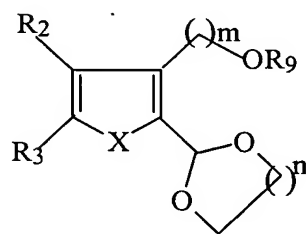


14. The method of claim 13, wherein R8 and R9 = H, alkyl or aryl, and said compound is selected from the group consisting of

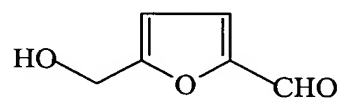
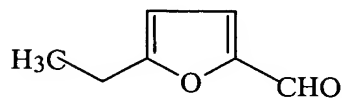
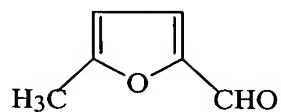




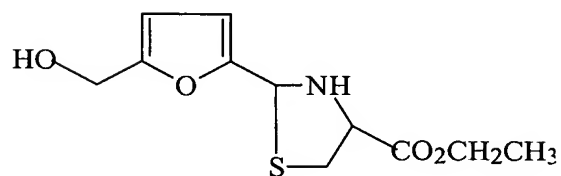
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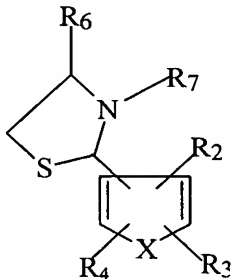
15. The method of claim 11, wherein said compound is selected from the group consisting of



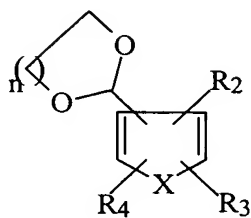
and



16. A compound selected from the group consisting of



and



where

R2, R3 and R4 are the same or different and are H, OH, alkyl, alkoxy, hydroxy-alkyl, halogen, aryl or O-aryl;

R6 and R7 are H or alkyl;

n = 0-4;

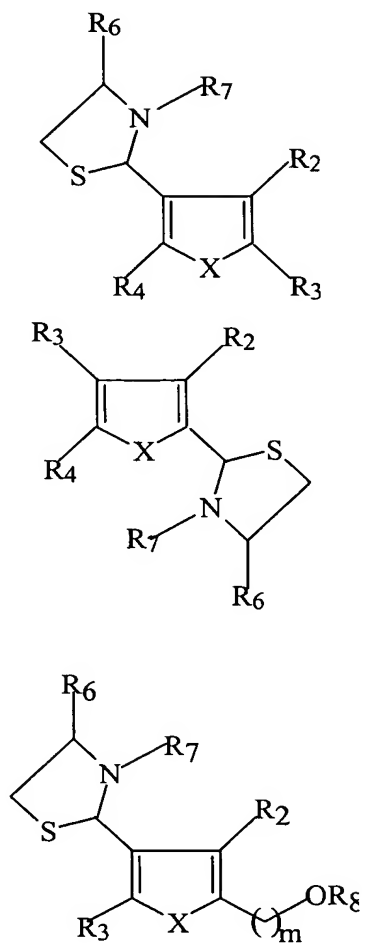
and X = NH, O, S, Se or P.

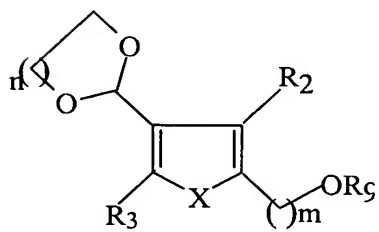
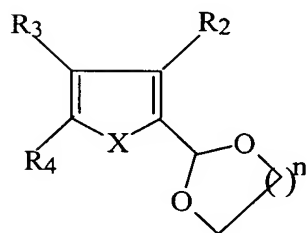
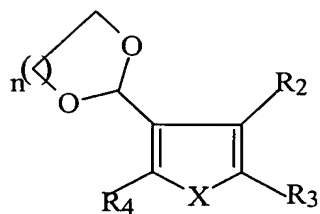
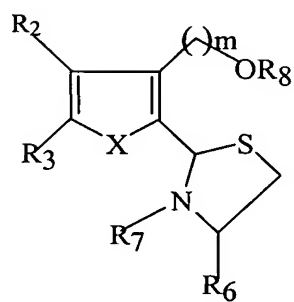
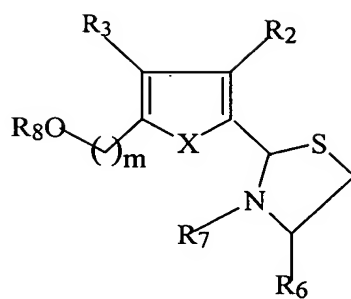
17. The method of claim 16, wherein

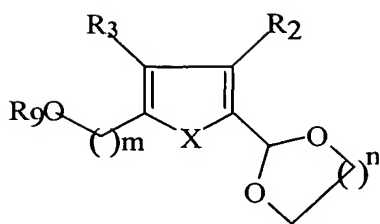
R8 and R9 = H, alkyl or aryl;

m = 1-6;

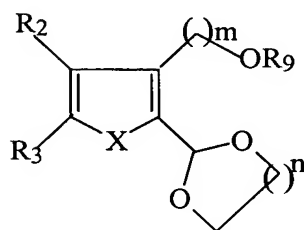
and said compound is selected from the group consisting of







and



18. The method of claim 16, wherein said compound is

